REMARKS

The description has been amended to replace the attorney docket number with the corresponding U.S. Patent Application Serial Number and to correct obvious typographical errors.

Claim 10 has been amended. Support for the amendment of Claim 10 appears in the specification at least at page 15, line 28 to page 26, line 24 and in FIG. 5B. Claim 22 has been amended to incorporate the limitations of Claims 23, 24. Accordingly, Claims 23, 24 have been canceled. Claims 25, 26 have been amended to be in independent form and to include the limitations of the base claim and any intervening claims. New Claims 35-37 have been added. Support for Claim 35 appears in the specification at least at page 15, line 28 to page 26, line 24 and in FIG. 5B. Support for Claims 36-37 appears in the specification at least at page 26, line 25 to page 29, line 16 and in FIG. 9.

Attached hereto is a marked-up version of the changes made to the description and claims by the current Amendment. The attachment (5 pages) is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

The sections below are numbered to correspond with the second numbering used in the Office Action.

1/2. Claims 1-7 and 9-11 are novel over Shinriki et al.

The Examiner states:

> Shinriki teaches ... a set of mass flow controllers (40 and 50) at a first position, a gas manifold (32) ... **a set of gas inlet valves (64)** ... . Shinriki also shows in **figure 1 that there is a supporting structure** for the processing chamber although it is not labeled in the drawing. (Office Action, page 2, emphasis added.)

However, the Examiner has failed to call out where Shinriki et al. teaches that the "gas manifold (32)" or "gas inlet valves (64)" are located at the "support structure". Further, the Examiner has failed to call out where Shinriki et al. teaches that the mass flow controllers 40 and/or 50 are

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located at a first location and that the "gas inlet valves (64)" and "gas manifold (32)" are located at a second location separate and removed from the first location.

Specifically, although the Examiner states that "Shinriki also shows in **figure 1 that there is a supporting structure** for the processing chamber", Applicant is unable to determine which structure the Examiner is referring to. Applicant respectfully requests clarification of which structure in FIG. 1 the Examiner is referring to as the supporting structure.

In Shinriki et al. FIG. 2, the process chamber 2 is illustrated in detail. Referring to FIG. 2, Shinriki et al. teaches:

> The showerhead 32 arranged on the ceiling of the process chamber 2 … (Col. 9, lines 42-43).

Accordingly, Shinriki et al. teaches that the showerhead 32, which the Examiner refers to as "a gas manifold (32)", is located **within** the process chamber 2. Further, the Examiner's statement that "a set of gas inlet valves (64) located **in between** the mass flow controllers and **the processing chamber**" (emphasis added) indicates that the "gas inlet valves (64)" are located **outside** of the process chamber 2. Accordingly, Shinriki et al. does not teach or suggest that the "gas manifold (32)" and the "gas inlet valves (64)" are located at a common support structure.

Further, referring still to FIG. 2, Shinriki et al. teaches:

> The inside of the **shower head 32** is divided into two spaces … . The space 32A … has a port 104 connected to the **gas passage 38** … . The space 32B … has a port 106 connected to the **gas passage 46**. (Col. 9, lines 51-56, emphasis added.)

Shinriki et al. further teaches:

> The **passages 38, 46**, 60, and 62 are provided with **switching valves 64** to open and close the passages, if necessary. (Col. 8, lines 14-16, emphasis added.)

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Of importance, the switching valves 64, which the Examiner refers to as "a set of gas inlet valves (64)", are not illustrated in FIG. 2 indicating that the switching valves 64 are **remote** from the process chamber 2. Thus, Shinriki et al. does not teach or suggest that the "gas manifold (32)" and the "gas inlet valves (64)" are located at the same location.

For at least the above reasons, Shinriki et al. does not teach or suggest a gas flow control system for a semiconductor processing unit comprising:

> a first mass flow controller located at a first location;
> **a support structure** located at said semiconductor processing unit;
> a gas manifold **located at said support structure**; and
> a first gas manifold inlet valve **located at said support structure** and coupled between said gas manifold and said first mass flow controller, **wherein said gas manifold and said first gas manifold inlet valve are located at a second location** separate and removed from said first location,

as recited in Claim 1, emphasis added.

Accordingly, Claim 1 is allowable over Shinriki et al. Claims 2-7 and 9, which depend from Claim 1, are allowable over Shinriki et al. for at least the same reasons as Claim 1. Claim 10 and new Claim 35 are allowable over Shinriki et al. for reasons similar to Claim 1. Claim 11, which depends from Claim 10, is allowable over Shinriki et al. for at least the same reasons as Claim 10.

For the above reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

3. Claims 22, 27-28 are novel over Barbee et al.

Claims 23, 24 have been canceled thus obviating the rejection of these claims. As to Claims 22, 27-28, the rejection is respectfully traversed.

The Examiner states:

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Barbee teaches a chemical vapor deposition system comprising: … a gas mixer (25) … an injector which regulates the gas flow **from** the mixer to the CVD processing chamber (16), … and **an exhaust line (21_3) and a valve (75) coupled to the mixer** (fig.4). (Office Action, pages 2-3, emphasis added.)

However, as discussed below, the injector is coupled to the mixer **separately** from the exhaust line (21_3) and valve (75).

Specifically, Barbee et al. sets forth:

In FIG. 4, where again **like reference numbers designate like or similar components as shown in FIG. 1**. (Col. 7, lines 11-12, emphasis added.)

In reference to FIG. 1 and thereby with reference to FIG. 4, Barbee et al. teaches:

The first output of the premix manifold assembly 26 is connected by line 29 **to the gas injector nozzle 19** of the CVD process chamber 16 … . **The second output** of the premix manifold assembly 26 is connected **to the exhaust line 21_3**. (Col. 4, lines 48-53, emphasis added.)

Accordingly, the gas injector nozzle 19 is connected to a first output. In contrast, the exhaust line 21_3 is connected to a different second output.

For at least the above reasons, Barbee et al. does not teacher or suggest a system comprising:

a mixer;
a first gas source coupled to an inlet port of said mixer;
a second gas source coupled to said inlet port of said mixer;
a first regulator coupled between said inlet port of said mixer and said first gas source;
a second regulator coupled between said inlet port of said mixer and said second gas source;
a third regulator coupled to an outlet port of said mixer; and
a check valve coupled to **said outlet port** of said mixer and to an exhaust,

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as recited in amended Claim 22, emphasis added. Accordingly, Claim 22 is allowable over Barbee et al. Claims 27-28, which depend from Claim 22, are allowable over Barbee et al. for at least the same reasons as Claim 22.

New Claim 36 recites a system comprising:

a mixer;

a first gas source coupled to an inlet port of said mixer;

a second gas source coupled to said inlet port of said mixer, **wherein a first process gas from said first process gas source and a second process gas from said second process gas source mix in said mixer;**

a first regulator coupled between said inlet port of said mixer and said first gas source;

a second regulator coupled between said inlet port of said mixer and said second gas source; and

a third regulator coupled to an outlet port of said mixer, said third regulator being a mass flow controller. (Emphasis added.)

Applicant respectfully submits that Barbee does not teach or suggest a system as recited in Claim 36.

For the above reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

4. ALLOWABLE SUBJECT MATTER

Claims 25-26 have been amended to be in independent form and to include all of the limitations of the base claim and any intervening claims. Accordingly, Claims 25-26 are allowable.

Applicant notes that Claim 8 is objected to as being depend upon a rejected base claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. As set forth above, Claim 1, from which Claim 8 depends, is allowable. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this objection.

CONCLUSION

Claims 1-11, 22, 25-28, 35-37 are pending in the application. For the foregoing reasons, Applicant respectfully

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requests allowance of all pending claims. If the Examiner has any questions relating to the above, the Examiner is respectfully requested to telephone the undersigned Attorney for Applicant(s).

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage for First Class Mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on April 17, 2001.

X _____
Attorney for Applicant(s)

April 17, 2001
Date of Signature

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Gary M. Moore		
Assignee:	Moore Epitaxial Inc.		
Title:	GAS FLOW CONTROLLER SYSTEM		
Serial No.:	09/399,611	Filed:	September 20, 1999
Examiner:	Fieler, E.	Group Art Unit:	1763
Docket No.:	MTEC1010		

Monterey, CA
April 17, 2001

Assistant Commissioner for Patents
Washington, D.C. 20231

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE DESCRIPTION

Paragraph beginning at Page 4, line 29 has been amended as follows:

After the high dopant concentration process gas was fully removed from reactor 14, the lightly doped P type silicon layer was deposited. Valve 42 was opened and process gas A, hereinafter referred to as low dopant concentration process gas, flowed through MFC 32 through valve 42 to exhaust 23 until the mass flow rate of the flow through MFC 32 stabilized. Valve 40 was opened and valve 42 was closed thereby providing the low dopant concentration process gas into reactor 14. The low dopant concentration process gas reacted with heated substrates 16 and formed the lightly doped P type silicon layer on substrates 16.

Paragraph beginning at Page 9, line 11 has been amended as follows:

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Also in accordance with the present invention, a method of controlling gas flow to a reactor includes opening a first gas manifold inlet valve coupled between a first mass flow controller, e.g., a first regulator, and a gas manifold and regulating a mass flow rate of a flow of a first process gas through the first gas manifold inlet valve to the gas manifold with the first mass flow controller. The method further includes opening [an] a gas manifold exhaust valve coupled between a second mass flow controller, e.g., a second regulator, and an exhaust and regulating a mass flow rate of a flow of a second process gas through the gas manifold exhaust valve to the exhaust with the second mass flow controller.

Paragraph beginning at Page 13, line 16 has been amended as follows:

For example, a process gas may be supplied to point of use 501 by gas flow controller system 500 to grow a layer on a semiconductor substrate. Short process gas supply line 506 significantly reduces or even eliminates the prior art problem of creating a transition layer after gas flow controller system 500 disconnects the process gas line or lines in the plurality of process gas lines 505 providing the process gas.

Paragraph beginning at Page 14, line 2 has been amended as follows:

Thus, gas flow controller system 500 of this invention permits formation of abrupt transitions between layers on a substrate using prior art processing equipment without modification to the processing reactor itself or installation of new substrate processing equipment. However, in one embodiment, to enhance formation of abrupt transitions between layers on a substrate, gas flow controller system 500 of this invention is used in combination with a gas dispersion head of Moore et al., related, co-filed and commonly assigned U.S. Patent Application Serial No. [[Attorney Docket No. MTEC1011]] 09/399,115, entitled "GAS DISPERSION HEAD AND METHOD", which is

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herein incorporated by reference in its entirety. Since this invention eliminates the need to obtain new processing reactors, the cost of production of substrates with state of the art feature sizes is reduced.

Paragraph beginning at Page 17, line 24 has been amended as follows:

As indicated above, gas flow controller system 500 is located as close as physically possible to injector ports 518 of semiconductor processing reactor 514 so as to minimize the length of process gas supply line 506. If possible, output port 568 of gas manifold 540 is connected directly to injector ports 518. The important aspect is to minimize the volume of gas in the piping, i.e., gas manifold 540 and process gas supply line 506, between gas manifold inlet valves 542, 544, 546, 548 and injector ports 518. Thus, when one or more of gas manifold inlet valves 542, 544, 546, 548 are closed, the time required to purge or evacuate gas manifold 540 and process gas supply line 506 is minimized because the volume of gas has been minimized. Consequently, there is not enough of the process gas available to from a transition layer of any consequence.

IN THE CLAIMS

Claims 10, 22, 25, 26 have been amended as follows:

10. (AMENDED) A system comprising:

a gas manifold;

a first process gas source located at a first location;

a first regulator coupled to said first process gas source, said first regulator located at said first location;

a first gas manifold inlet valve coupled between said first regulator and said gas manifold, wherein said gas manifold and said first gas manifold inlet valve are located at a second location separate and removed from said first location;

a second process gas source located at said first location;

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a second regulator coupled to said second process gas source, said second regulator located at said first location; and

a second gas manifold inlet valve coupled between said second regulator and said gas manifold, said second gas manifold inlet valve located at said second location.

22. (AMENDED) A system comprising:

a mixer;

a first gas source coupled to an inlet port of said mixer;

a second gas source coupled to said inlet port of said mixer;

a first regulator coupled between said inlet port of said mixer and said first gas source; [and]

a second regulator coupled between said inlet port of said mixer and said second gas source;

a third regulator coupled to an outlet port of said mixer; and

a check valve coupled to said outlet port of said mixer and to an exhaust.

25. (AMENDED) A system comprising:

a mixer;

a first gas source coupled to an inlet port of said mixer;

a second gas source coupled to said inlet port of said mixer;

a first regulator coupled between said inlet port of said mixer and said first gas source;

a second regulator coupled between said inlet port of said mixer and said second gas source;

a third regulator coupled to an outlet port of said mixer;

a check valve coupled to said outlet port of said mixer and to an exhaust, [The system of Claim 24] wherein a first flow of a process gas exits said mixer, wherein a second flow of said process gas passes through said third regulator, a difference between said first flow and said second flow being a

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third flow of said process gas which passes through said check valve.

26. (AMENDED) A system comprising:

a mixer;

a first gas source coupled to an inlet port of said mixer;

a second gas source coupled to said inlet port of said mixer, [The system of Claim 22] wherein said first gas source is a dopant gas source and wherein said second gas source is a carrier gas source;

a first regulator coupled between said inlet port of said mixer and said first gas source; and

a second regulator coupled between said inlet port of said mixer and said second gas source.

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